be increased in those districts where the grower himself engaged in producing the oil from the seed. The substance remaining from the oil manufacture, or sunflower cakes, being used as cattle food, is also a valuable product. These cakes, however, have a comparatively small demand in Russia, but are largely exported to foreign countries, principally to Germany and England. The government of Saratov, for instance, exports about 2,000,000 pounds of sunflower cakes to different countries, where a further quantity of oil is extracted from them before being used for cattle food. The sunflower shells being used for heating purposes, form an article of trade in several districts. The seed-cups are not wasted, but are used as food for sheep. The peasants in the government of Tambov are increasing the cultivation of the sunflower owing to the following reasons. There is a steadily increasing demand at home and abroad for the seed, thus making the industry a profitable one, especially as Russia is the chief source of supply. As above mentioned, the sunflower is cultivated principally for the oil. If the cultivation is made with care, and if proper precautions are taken in drying, cleaning, and pressing, sunflower oil is equal to the French table oil in color, flavor, and taste. At first sunflower oil did not meet with public favor in Russia, but later on, owing to its good qualities and cheapness, it took the place of the oil of poppy seed; but for a long time hemp-seed oil competed with it, owing to the fact that the lower classes, who for many years had used the hemp-seed oil in the preparation of various dishes, and who had learnt to relish it, were not disposed to give it up. Now, however, public opinion has changed, and sunflower oil is preferred by the masses to all other table oils in Russia. The process of oil-making is as follows. The seed being brought to the oil mill, is thoroughly cleaned and sorted. They are passed under millstones, specially prepared for the purpose, in order to release the seed from the shells. After this the seed is properly dusted and put under a press, and, later on, into a mixer, where the seed is turned into a compact mass very much like paste, which passes into vessels heated by steam. From these vessels the paste is taken out and wrapped in a thin web, made of camel hair, and put under a press, by which the oil is squeezed out and conducted by pipes into tanks. The total number of oil mills in Russia was, according to the last account, 104. From this number 85 were applied solely to obtaining sunflower oil. In 24 of these mills steam is used, and in others only manual power. The largest mill is at Saratov, and it produces 1,500,000 pounds of oil annually. There are two kinds of oil obtained from the sunflower seeds. The better kind is sweet, and more expensive, the inferior having a bitter taste. The difference in price of these two qualities is about one halfpenny a pound. The oil remaining from the oil production or the waste, and not used as food, is applied exclusively to certain industries. The sunflower stalks, gathered from the fields, and dried in piles, have entirely replaced firewood; in fact, these stalks are preferred even to pine-wood, producing a quick and hot-flame fire. About 2,000 pounds of such firewood are gathered from an acre of land, thus adding a great boon to a district where wood is scarce. Sunflower shells are also used for heating purposes, not only in private houses, but in large factories as well. They are burned in ovens specially prepared for their consumption. The ashes of the sunflower contain a large percentage of potassium. The experiments of Hermbstedt have proved that 1,000 pounds of dried stalks yield 57.2 pounds of ash; and from 1,000 pounds of ash are obtained 349 pounds of the best potassium. As a food for cattle, sunflower cakes are looked upon as the best in Russia; they are considered better even than hemp or rape-seed cakes. According to chemical analyses, the sunflower cakes from the Government of Saratov contain: Azotic substances, 42.31 per cent; oil, 14.7 per cent, and ashes, 5.12 per cent. The dried seed-cups, if ground, are used in many districts as food for cattle, and particularly for sheep, with great success.

FLEXIBLE TUBING.[1]

AT a meeting of the London Society of Arts, held on Wednesday evening, March 23, Mr. G. R. Redgrave gave an interesting lecture upon the subject of flexible tubing. After a passing reference to rubber tubing, leather hose, and similar ancient forms of this tubing, he proceeded to describe the flexible metallic tubes which had been invented by Mr. E. Levavasseur. This gentleman is, it appears, a jeweller, and many years ago invented necklaces and bracelets made out of tubes produced by coiling together two strips of gold and silver. One of these strips had a channel section, and the other, of a semicircular section, served to unite adjacent coils of the channel section together, and form a complete tube. About six years ago the idea occurred to him that flexible tubes could be formed on the same principle out of strips of metal, the tightness of the joints being secured by a strip of rubber. Many different forms of section for the strip were tried, the first being a sort of double channel section with which a great amount of flexibility was secured, but the heavy strain thrown on the rubber caused it to wear rapidly. In a later form the strip used was somewhat of the shape of a figure 8, which gave a more perfect interlock, so that the disruption of the tube could only be effected by the strips splitting under the strain. The rubber, too, was better protected and there was less chance of its working out. But this tube was less flexible than its predecessor, and suffered from the same defect in that the tightness of the joint depended upon a perishable material. Other forms of strips were tried in succession, and finally one has been arrived at in which a perfectly tight joint is secured without the use of any packing whatever, metallic surfaces only being in contact. The tubes thus formed are found to be tight under both high and low pressures, the form of the strip being such that the greater the pressure the tighter the joint. These tubes have been successfully used for conveying petroleum oil gas at a pressure of 300 pounds per square inch, and a small tube $\frac{3}{4}$-inch in diameter formed out of a strip 14 millimetres wide and .6 of a millimetre thick, only yielded at a pressure of 2,000 pounds per square inch. The tubes, moreover, will stand a partial vacuum. Their flexibility is such that a $\frac{5}{16}$-inch tube can be bent to a radius of 4 inches, and a one-inch tube to one of 6 inches. The tubes, moreover, can be trodden on with impunity, and would almost stand a cart being driven over them, a load of 18 hundred-weight on one inch of bearing surface being required to compress a 1 inch tube to an oval section. The difficulties of manufacture have been considerable, long flexible strips of a soft and uniform metal being required. Thus the $\frac{3}{4}$-inch tubes are made out of a strip 14 millimetres wide and .6 of a millimetre thick. At present such strips cannot be obtained of a greater length than 6,000 feet to 7,000 feet, and as 10 feet of strip are required for each 1 foot length of tube, the greatest continuous length that can be produced at the present time is limited, but it is thought that by means of electric welding this difficulty will

[1] From Engineering.

be overcome. The whole of the operations of forming the strip into the finished tube are accomplished in one continuous process by a single machine. The weight of the various sizes of tubing now manufactured ranges from 2½ ounces per foot for the $\frac{5}{16}$-inch tubing, which is the smallest size manufactured, up to 17 ounces per foot for the 1½-inch tubing.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Zoology in the Public Schools of Washington, D.C.

IF there be one thing clearer than another to all thinking people of this or of any other highly civilized nation at the present time, it is that we are living in an age of great scientific progress. Among the dominant, most highly cultured races of the world this progress is characterized by its great rapidity, the exactness of its methods, and its far-reaching influence. It extends into all departments of human activity; it is felt along every imaginable line, both where the ends and aims are of a most utilitarian kind, as well as in quarters where the results arrived at appear to be, for a time, of a most impracticable nature. Solutions of abstract questions solved by the scientific philosopher and student, no longer, as of old, remain for an indefinite period hidden in an inaccessible literature, but quickly see the light in many places, and, in an incredibly short space of time, appear in the general literature of the day, in school and college text-books, and even in the daily newspapers. This being true, it was with no scant measure of surprise that the present writer had brought to his attention, very recently, a most remarkable case of misinstruction on the part of one of the teachers in a public school of Washington. It is no more than fair to say, however, that the statement made by the instructor to whom reference is made is supported by the author of one of the text-books in general use by the public schools throughout the District. The book in question is Mr. William Swinton's "Grammar School Geography," and in that production the author has adopted the plan of asking a series of questions, and then printing the replies to them on one of the maps given in illustration. On page 71 of his geography he asks, "What fish are taken in the Arctic region?" and on the accompanying map leaves the student to choose among a number of forms there given, none of which are *fish*, however, but where prominently occur such animals as the whale and the narwhal,—both of the last-named being typical and well-known marine mammals.

One of my sons attends the school to which allusion has been made, and it fell to his lot to get this question, and in making answer stated that no fish were named on the map in the Arctic regions; whereupon the teacher contended that both whale and narwhal were fish,—"and very big ones, too,"—directed him to take his seat, marked the reply against him as a miss, and appeared to be well pleased that the next scholar in turn replied more in keeping with his own notions in the premises, by stating that two large fish, at least, were found in the Arctic regions, and cited the two that have just been named. Now if there be one fact that zoology has made clearer than another, and it has been given in all authoritative lexicons, encyclopædias, and text-books throughout the world, it is that both the whale and narwhal are, as has been said, typical marine mammals, and belong just as much to the class Mammalia as does a man or a bear.

The believing that the whale is a big fish carries us back almost to the time when people entertained such erroneous conceptions of the earth and the creatures that live upon it, that it was popularly thought that the former was flat, that bats were birds, and horse-hairs could be converted into living hair-worms. My surprise is so great indeed at such a state of affairs existing in these times in our very midst that it absolutely forbids my making any comment thereon for fear that language might fail me to do the matter justice. It is surely high time that some effective course in elementary biology be included in our public school curriculum, and the sooner it is done, the sooner will our children come to be familiar with common facts, the true nature of things as they exist, and learn to appreciate the significance of a long-exploded idea when they meet with it.

R. W. SCHUFELDT.

Washington, D.C., April 4.

The Question of the Celts.

DR. BRINTON, in the last number of *Science*, asks Dr. P. Max Foshay for evidence upon certain suggested points, and now I should like to follow his example, and ask Dr. Brinton for his evidence that Dr. Theodore Köppen "repeats the familiar error of attributing the theory of the origin of the white race in Europe to Dr. Latham; whereas, long before he mentioned it, it had been urged with clearness by Omalius D'Halloy, the distinguished Belgian anthropologist" (*Science*, vol. xix., p. 174). Both Otto Schrader, "Prehistoric Antiquities of the Aryan Peoples" (Jevons's translation), p. 85, and Canon Isaac Taylor, "The Origin of the Aryans," p. 20, agree in assigning this distinction to the late eminent English philologist, as propounded by him in "The Germania of Tacitus, with Ethnological Dissertations and Notes," London, 1851, Epiligomena, p. cxxxix. (now before me). Will Dr. Brinton refer me to the work of "the distinguished Belgian anthropologist," and inform me whether he is in any way related to the distinguished Belgian geologist, Omalius D'Halloy?

Also, I should be glad to be referred to the work of Broca, in which he states that "the small, brown, brachycephalic Celts are a mixed type" (*Science*, ibid., p. 117). I have always understood Broca to maintain that they are a pure type, the real Celts of Cæsar's time, and that they are now represented by the inhabitants of central France.

Again, what is Dr. Brinton's authority for calling the type "of tall stature, with reddish or blond hair, and dolicocephalic crania," the Kymric? Is not this the Scandinavian, or Teutonic type, of Penka, which he regards as the original Aryan type?

Dr. Brinton is surprised to find Professor Schaaffhausen of Bonn denying that "the bands who overran Italy in 393 B.C. were Celtic. Surely the title of their chiefs, *brennus*, 'king,' is evidence enough that they spoke a Celtic dialect" (*Science*, ibid., p. 146). But speaking a dialect is no proof of blood relationship, and I suppose Schaaffhausen thinks that the followers of Brennus were really Galated, or of German origin. This is the problem discussed by Niebuhr, "History of Rome" (English translation), vol. ii., n. 1,169, in which the testimony of Celtic authors is quoted to show that the hair of the invading Celts was yellow, or red, while all Celtic peoples now have black hair. Niebuhr thinks that the law of permanency of physical constitution does not hold good for the hair, since now yellow or red hair has become uncommon among the Germans and Scandinavians in most parts. Thus it would seem that we can rely neither upon linguistic nor ethnological arguments wholly to settle the vexed question of the Celts.

HENRY W. HAYNES.

Boston, April 6.

AMONG THE PUBLISHERS.

THE famous geographer, Élisée Reclus, has just received, says *The Publishers' Weekly*, an unusual honor from the Paris Geographical Society. It has long been one of the traditions of this society that its gold medal should be awarded only to explorers who make discoveries of the first importance. This year it has deviated from its time-honored rule and has awarded its medal to a writer instead of to an explorer. The honor was given to M. Reclus to commemorate the approaching completion of his great work, "Nouvelle Géographie Universelle." The work is in eighteen large volumes, and Reclus is now at work on the last one. Reclus began this immense task in 1875. It is a monument of geographical learning, and, though intended for the people and written in a popular style, it is thoroughly scientific in spirit and treatment. It is an interesting fact that if it had not been for the intervention of Darwin and other great scientific men of England this greatest of all popular geographies would probably